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Iowa State University Department of Industrial and Manufacturing Systems Engineering

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*Industrial and Manufacturing Systems Engineering***IMSE**
n e w s

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PRACTICAL LAB EXPERIENCES PREPARE STUDENTS FOR INDUSTRY

Laboratory practice, with an element of design, is a significant component of both the undergraduate and graduate programs in IMSE. Our goal is to provide students with an environment in which they can apply and integrate classroom principles into the design, operation, and control of manufacturing systems. Here's an update of the eight laboratories that currently serve undergraduate students.

Industrial Design

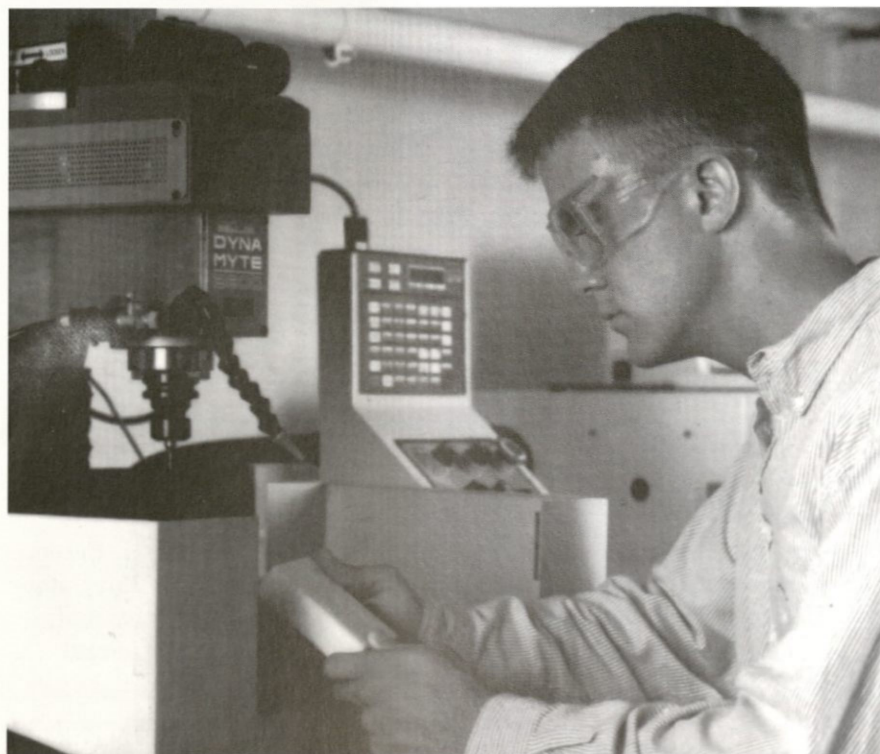
This lab primarily serves IE students during their design efforts for Industrial Engineering Design, the senior capstone design course. An industrial partner provides students with a real-world design problem that is open-ended, represents an existing need, and is typically a facilities design/layout problem. Students, in teams of three or four, synthesize solutions and present them through written and oral reports to the industrial partners at the semester's end.

Computer hardware and software available in the lab assist students throughout the design process. The lab also serves as a classroom for the lab section meetings. Although the focus of



Quality lab

the lab is the Industrial Engineering Design course, the facility also provides access to computers and software for several other IE courses, including Applied Ergonomics, Operations Analysis, and Industrial Materials Handling.



Manufacturing processes lab

Hardware includes eight workstations for students (Zenith and HP), a Zenith Network Server, two HP plotters, and an HP LaserJet printer. A computer overhead projection system has been provided by John Deere Ottumwa works.

Ergonomics

Through the use of appropriate instrumentation, this lab offers students practical experience with ergonomic concepts, workplace principles, and task design. Equipment includes a Lafayette Instrument Datagraph, Complex Reaction Timers, eight computers (Zenith), two printers, and a Vincent DECstation 2100 workstation. Mannequin, Work Physiology, and Biomechanics software are also available in the lab. Equipment needs include computer interfaces for direct input of physiological and biomechanical data with appropriate transducers, complete video analysis system for biomechanics analysis, complete electromyographic system, lap top computers for on-site use by students, and an oxygen measurement system for workload analysis.

Operations Analysis

This lab serves our Operations Analysis course. Facilities and equipment in the lab are used for exercises in work measurement, workplace rating, motion study, micromotion study, work sampling, predetermined motion times, workplace design, process design, assembly line balancing, man-machine relationships, and learning curves. The lab contains a line balancing assembly unit, man-machine charting equipment, video equipment, micromotion study equipment, and a 26-inch monitor.

Manufacturing Processes

This lab serves our Industrial Methodology course. Students learn how to operate and program the equipment, using it to investigate basic metal chip-removing processes and NC programming. In addition to eight computers (Macintosh and Zenith) and a Vincent 2100 DECstation workstation, the lab equipment includes two DynaMyte 2800-CNC milling/drilling machines, a DynaMyte 300 CNC lathe, a

Langun 6-axis manual milling machine, and a Takisaw manual lathe. Equipment needs include four manual mills, four manual lathes, two additional CNC mills, a CNC lathe, and a Grinder.

CAD/CAM

The CAD/CAM laboratory serves our CIM I and II courses. Students use graphics software and engineering workstation platforms to construct software for

*continued on page 3***THREE NEW LABS PLANNED**

To continue departmental efforts to help students gain valuable hands-on experience, plans are in progress for three new laboratories.

The **Casting/Welding Laboratory** will serve the Industrial Methodology course and future new manufacturing courses. No equipment has been obtained to date. Equipment needs include investment casting equipment, induction furnaces, sand molds, and welding stations.

The **Electronics Assembly Laboratory** will serve several courses, including Industrial Methodology, Manufacturing Systems Control, Industrial Materials Handling, and Computer-Integrated Manufacturing. We are pleased to report that the following equipment donated by Rockwell International is on site, waiting to be installed: circuit board assembler with robots, screen printing, part feeders, and material handling and inspection equipment.

The **Robotics Laboratory** will be used mainly by two courses, Industrial Materials Handling and Computer-Integrated Manufacturing II. Three assembly robots and a programmable logic controller are waiting to be installed in this laboratory.

IMSE GAINS MORE SPACE

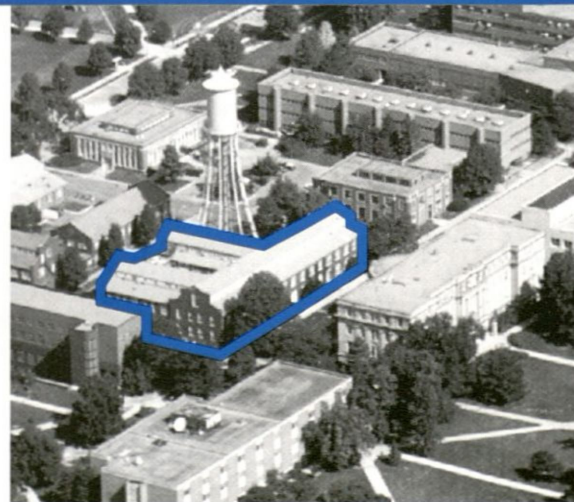
Good News! New Space!.... Well, not exactly new space...but it is *more* space. We are moving out of Marston Hall and into the Engineering Annex where we acquired space being vacated by the Department of Materials Science Engineering. Approximately 75 percent of the building will be ours.

The ground-floor level consists of office space adjacent to laboratories and a nice suite comprised of six new offices and a small conference room. The ground floor also will house three new laboratories: a casting/welding lab, an electronics assembly lab, and a robotics lab. The senior capstone design

laboratory for IE 441 will move from Marston Hall to the second floor of the Annex.

In addition, the manufacturing processes lab will move from the basement of the Nuclear Engineering building to a ground-floor room in Sweeney Hall. This new space offers tremendous improvements in lighting and ventilation and will relieve the difficulties involved in moving the processing machines in and out of the room.

Now for the bad news: all of our available space is already filled. Wishful thinking is that we will have our own building one day!



COMMENTS FROM THE INTERIM CHAIR



The IMSE Department is on the move! I will be serving as interim chair this academic year as we embark on a search for a new departmental chair who will provide leadership into the 21st century. Dr. Way Kuo has accepted a position at Texas A&M University.

In early summer, Engineering Dean Kao appointed a search committee with Dr. Steve Vardeman serving as chair. The committee immediately began work on this important task of finding a new chair. We encourage you to contact Dr. Vardeman (515-294-2535) with names of potential candidates. We will keep you posted in the search process as it develops.

Improving Curriculum

At both the undergraduate and graduate levels, we are continuously improving our curriculum to reflect modern practices in

industrial and manufacturing environments. In the undergraduate curriculum, our courses in simulation and materials handling have been changed from electives to required courses. The C computer language also has been added as a required course, and the entry level course, IE 201, has been replaced with engineering economy. It is interesting to note that, since the 1989-91 catalog, we have dropped 13 courses, changed 7 courses, and added 12 courses. The added courses include simulation, TQM, reliability, CAD, CAM, expert systems, engineering metrology, design for humans in industrial systems, and interdisciplinary design.

In the graduate program, we have dropped 15 courses, changed 7 courses, and added 9 courses. The added courses include computational geometry, geometric modeling, advanced computer-aided manufacturing, systems engineering, advanced expert systems, economics of production, and continuous quality improvements.

Developing Our Labs

Laboratory development is a high priority for our department. You are well aware of the fact that in the last five years we have initiated a major laboratory development program which continues to receive much of our attention. These laboratories include CAD/CAM, manufacturing systems, quality, and materials handling. We continue to have needs for manufacturing

equipment to provide students with hands-on experience. We have come a long way, but there is still room for improvement.

In the page one article about space, you will note that we received additional space in the Engineering Annex for offices and laboratories. We have already exceeded the capacity of this new space.

Placement Update

Our students continue to compete well in the job market. Last spring, 52 percent of the graduating seniors had already accepted jobs two weeks before graduation and 18 percent were still in the interviewing process. Among the remaining, 14 percent planned to enter graduate school and 16 percent chose not to interview. Companies hiring our graduates last spring include Trane, Honeywell, Motorola, Omaha Public Power, Donnelley, Eaton, Andersen Consulting, 3M, Caterpillar, Rockwell International, General Motors, and General Electric.

National Rankings

I am pleased to report that the 1993 Gourman Report ranked the IMSE undergraduate program as number 13 among programs in American and international universities. Universities that ranked ahead of Iowa State are: Stanford (1), Michigan-Ann Arbor (2), California-Berkeley (3), Purdue (4), Northwestern (5), Georgia Tech (6), Cornell (7), Ohio State (8), Columbia (9), Texas A&M (10), Wisconsin (11),

and Iowa (12). We were ranked above universities such as Illinois, Penn State, Florida-Gainesville, and all of the Big Eight schools.

The same report ranked the IMSE graduate program at number 11. Universities that ranked ahead of Iowa State are: Michigan-Ann Arbor (1), California-Berkeley (2), Stanford (3), Purdue (4), Wisconsin (5), Cornell (6), Georgia Tech (7), Northeastern (8), Texas A&M (9), and Ohio State (10).

Welcoming New Faculty

This academic year promises to be exciting in terms of faculty activity and research. We welcome Drs. Carolyn Heising, Sharon Filipowski, and Raymond Cheung who joined us this fall semester. And we look forward to welcoming Drs. Ralph Scrutton and Young-Woo Park who will join us in January.

Your Support is Appreciated

Thank you for your past financial support which has helped to make this all possible. We invite you to become a partner with us in our efforts to make the IMSE department one of the premier departments in the country. If you wish to support the department with a gift this year, please use the enclosed envelope for your convenience. The faculty join me in sending our thanks and well wishes to all of you.

G.M. Montag

was instrumental in revising the university's medical insurance plan to maintain adequate coverage for mental/nervous and drug/alcohol abuse treatment while controlling costs.

STUDENTS

ISU's TBP IS RATED BEST IN NATION

For four consecutive years, Iowa State's engineering honor society has been judged best chapter or runner-up among the 209 student chapters nationwide.

The Alpha Chapter of Tau Beta Pi received the national organization's R.C. Matthews Outstanding Chapter Award for 1991-92 at the district convention last April. Tammie Galles, a senior in industrial engineering from Remsen, Iowa, and Alpha Chapter president, accepted the award on behalf of the chapter. ISU's Tau Bates were cited for their diverse achievements, extracurricular projects, and commitment to the ideals of Tau Beta Pi.

Each of the 300 members of ISU's TBP chapter is required to participate in at least one service or outreach project. The projects conducted included peer tutoring,

a recycling symposium, tree planting, an elementary school carnival, highway litter clean up, high school outreach, and YMCA camp renovations.

The ISU chapter also was named outstanding chapter in 1989-90 and was a runner-up in 1987-88, 1990-91, and 1992-93.

IE STUDENT PLACES FIRST IN SWE COMPETITION

Amy Van Dyke, a senior from Wheaton, Illinois, took top honors in the Society of Women Engineers' 1993 Technical Paper Competition with her paper, *Mechanical Damage to Soybean Seed During Bag Handling*. The paper was based on research she conducted as a participant in the National Science Foundation's Research Experiences for Undergraduate program in the Agricultural and Biosystems Engineering Department at ISU.

After receiving the \$200 first place prize in SWE's regional contest with her written paper, Amy topped five other regional winners in an oral competition at the SWE conference in Chicago. She received a \$1,500 prize and is preparing her paper for publication.

SPOTLIGHT ON NEW FACULTY

Carolyn Heising



Dr. Carolyn Heising, IMSE's newest professor, comes to Iowa State University from Northeastern University in Boston where she served as professor of industrial engineering and information systems since 1984. From 1980 until 1984, she was assistant professor of nuclear engineering at the Massachusetts Institute of Technology.

Dr. Heising received her Ph.D. degree from Stanford University in 1978 in mechanical engineering with a minor in operations research. She holds a M.S. degree in nuclear engineering sciences from Stanford (1975) and a B.S. degree in applied physics from the University of California-San Diego (1974).

Dr. Heising's achievements have been widely recognized. In 1987 the American Association of University Women honored her with their Young Scholar Award. For her doctoral thesis in 1978 she received the Institute of Nuclear Materials Management's best student paper award. And in 1992, she was elected to serve a three-year term on the national board of directors of the American Nuclear Society.

Dr. Heising visited Russia in 1991 as one of only two Americans invited as plenary speakers at a conference on nuclear power plant safety and personnel training. Her research specialty areas include reliability and risk analysis, quality control, and technology safety assessment. She is a well-known authority on nuclear power plant safety.

Raymond Cheung



Dr. Raymond Cheung joined the IMSE department as an assistant professor in August 1993. He received his B.S. (1984) and M.A. (1985) degrees in applied mathematics from York University in Canada. From 1985 until 1987, Dr. Cheung taught operations research and quantitative analysis at Hong Kong Polytechnic, Hong Kong. He returned to North America and earned his M.S. (1989) and Ph.D. (1993) degrees in operations research from Princeton University.

Dr. Cheung's area of research is the development of optimization-based planning systems for logistics, transportation, and related operational problems. This work involves developing and testing models and algorithms, software implementation, graphical display of results, and managing databases required to solve these problems. His research activities have spanned two areas. The first area focuses on a real-time, freight-dispatching planning system that involves routing drivers and timing the departure of freight. The objective is to minimize operating costs while maintaining a high level of service subject to complicated constraints, such as labor union rules. The second area centers on modeling and solving stochastic networks. In such problems, decisions must be made over time, under uncertainty. Applications of these problems can be found in fleet management, telecommunication networks, financial planning, production, and distribution planning.

Sharon Filipowski



Dr. Sharon Filipowski also joined the IMSE department as an assistant professor in August 1993. After receiving her B.S. degree in mathematics from Stanford University in 1988, she attended the School of Operations Research and Industrial Engineering at Cornell University where she earned her M.S. (1991) and Ph.D. (1993) degrees in operations research. In the summer of 1993, Dr. Filipowski was invited to present some of her research at the Association of Women in Mathematics meeting that was held in conjunction with the Society of Industrial and Applied Mathematics annual meeting.

Dr. Filipowski's research combines linear programming, numerical analysis, and optimization. She has been developing a complexity theory for linear programming that allows for the use of an approximation to the data of the actual instances, additional information about the actual instance, as well as condition measures when analyzing the efficiency of an algorithm. The development of this complexity theory involves the construction of algorithms that use the approximate data and the additional information to provide an approximate solution to the actual problem instance. These algorithms are efficient in that they use minimal computational precision. Dr. Filipowski also studies perturbation theory in linear programming.

Lab Experiences continued from page 1

manufacturing applications. Hardware includes IRIS workstations, Vincent DECstations, Macs, HP computers, and IBM and GE robots. To improve the lab's computational and graphics capability, additional Silicon Graphics workstations with more capabilities are needed.

Manufacturing Systems

The manufacturing systems laboratory serves our Manufacturing Systems Control course. Students use computer control systems as well as mechanical, electronic, and pneumatic prototyping systems to prototype manufacturing systems. Programmable logic controllers are needed to provide cell control for manufacturing systems developed by the students.

Quality

Students in our Industrial Methodology and Engineering Metrology courses use the Quality Lab. In addition to providing computer support, the lab has coordinate and texture measuring instruments for measuring product attributes. The lab uses computer simulations of manufacturing systems to create an environment in which students react to changing variables that impose potential problems in product quality. A direct, computer-controlled, coordinate measuring machine is needed to enhance our capability in measuring part geometry. Additional manual coordinate measuring machines are needed to increase student access to the equipment.

Materials Handling

In this laboratory, an automated conveyor system and automatic guided vehicles provide hands-on experience in material handling. The laboratory is still in the development stage and needs an automated storage system.



Materials handling lab

IMSE AWARD WINNERS

FACULTY

Geraldine M. Montag, professor and interim chair, received the *Regents Faculty Excellence Award* in recognition of her contributions to excellence in public education and service to Iowa State University. Dr. Montag was honored for her demonstrated commitment to classroom excellence and her outstanding service to the department in developing critical documentation for departmental policies and our graduate and undergraduate programs. She also served in the dual capacity as director of graduate studies and of undergraduate studies, positions normally held by two faculty.

STAFF

Lynn Franco, departmental secretary, received the *ISU Alumni Association's 1993 Superior Service Award* in recognition of her outstanding service to the Department of Industrial and Manufacturing Systems Engineering. Lynn is highly regarded by her peers and sets a fine example of commitment to serving students, faculty, and staff. Progressing quickly from entry-level secretary to supervisor in the department, she has demonstrated extraordinary care



and professionalism with every assignment. Her department chair credits her leadership for staff productivity and high morale, citing her as a role model for others.

Lynn has worked with many special projects for faculty, students, and alumni, and recently developed a slide show to inform high school students about industrial engineering. She works closely with alumni who serve on the IMSE Advisory Council, coordinating meetings and preparing reports. As president for the Alliance for the Mentally Ill of Central Iowa, she

STUDENTS AND FACULTY HONORED AT '93 BANQUET

Last April, 120 people gathered at the annual Student/Faculty/Parent Banquet to recognize the many achievements of IMSE students and faculty. Twenty-eight student scholarships totaling \$26,000 were announced and faculty members were recognized for their teaching and research accomplishments.

The generous donations of individual and corporate sponsors enabled students to purchase tickets for the event at a reduced cost. The IMSE department wishes to thank and recognize the friends listed here for their generosity in supporting the IMSE Banquet.

ALCOA
Andersen Consulting Company
General Motors
John Deere Foundation
Deere & Company
Maytag Company Foundation
Minnesota Mining & Manufacturing (3M)

Please stay in touch!

We want to hear about your career moves and personal news for our alumni news page. Please return this form in the self-addressed envelope enclosed in this issue.

We need your help, too, with donations to scholarship funds, lab facilities, and student groups. If you are making a contribution to your alma mater, please consider designating it to the IMSE department.

If you are making a pledge, please complete this alumni information form and the Pledge Commitment section of the College of Engineering Annual Giving Fund reply envelope, and return it. Please note that you may specify the months you will receive reminders.

If you choose to fulfill your commitment immediately, please enclose your contribution and alumni information form in the enclosed reply envelope today. This will give us the opportunity to make your gift work much sooner and will save on future pledge reminder costs. Thank you for your support!

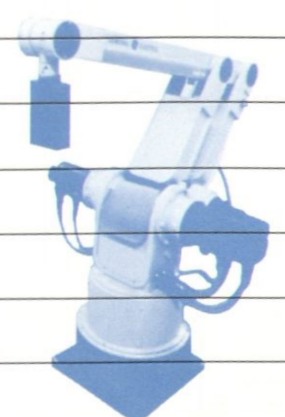
Name _____

Address _____

City, State, Zip _____

Year of graduation _____

I want to tell you about: _____



IMSE

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A · L · U · M · S

1938

LeRoy F Harlow, GE, professor emeritus of organization and management in the Marriott School of Management, Brigham Young University, has written a how-to book, *Democracy Efficiently at Work: Better Government for All*, published by Marcel Dekker, Inc., New York, N.Y. He resides at 1855 N. Oak Lane, Provo, Utah, 84604.

1979

Kathryn A. (Peters) Dagestino, IE, is senior manager at Ernst & Young's Management Consulting Practice and specializes in performance improvement in the public sector and utilities. She resides at 620 W. Wedgewood Ln., La Habra, CA., 90631.

1980

Paul S. Adams, IE, earned his Ph.D. in industrial and operations engineering from the University of Michigan, May 1, 1993. He accepted a position as assistant professor of occupational safety at Illinois State University.

1983

Stephen B. Moore, IE, recently assumed the top civilian position, technical/deputy director at the defense mapping agency combat support center, a major combat support agency of the Department of Defense. His address is 6001 MacArthur Blvd., Bethesda, MD 20816-5001.

Tom J. Nauman, IE, joined Puritan-Bennett FOxS Division in Carlsbad, California in September 1993 as an industrial engineer. He

acquired the position through the recommendation of David Sharshaug, BSIE 1984, who was leaving the company. Mr. Nauman has worked for other California companies, including Alcoa Electronic Packaging, Adila (composite golf equipment), and Square-D Topaz Division.

1985

Sandra J. (Sear) Belvedere, IE, married Sam Belvedere, May 1991. She was promoted to manager, retail support center, Saturn Corporation, Spring Hill, Tennessee, in August 1992.

David G. Rush, IE, has been promoted to principal of Kurt Salmon Associates, an international management consulting firm, headquartered in Atlanta, Georgia. Mr. Rush is a specialist in distribution and logistics strategy and design.

1989

Chris Wagner, IE, manufacturing engineering radiator department, Ford Electronic & Refrigeration Co., 4747 Western Ave., Connersville, IN 47331.

1990

Mark Steffen, IE, is management engineer at the University of Iowa Hospitals and Clinics in Iowa City. His address is 35 Lincoln Avenue #2, Iowa City, IA 53346.

1991

1Lt. Scott D. Pauley, IE, graduated from USAF pilot training in April and is flying KC-135 aerial refuelers. His address is 2727 53rd, Apt. B201, Spokane, WA 99223

Deere's new 710D series backhoe. She was responsible for tracking potential assembly and fit-up problems, as well as identifying tooling and fixturing that would be necessary when the product was integrated with an existing assembly line. She worked closely with design and manufacturing engineers to identify possible improvements and keep track of potential changes in product design that might affect assembly.

Deanna recently moved to quality engineering where she is responsible for the qualification of new manufacturing equipment and the process capability of existing equipment. After identifying product features that are critical during welding, machining, and assembly operations, she works with design engineers to set appropriate tolerances. Machine capability studies are conducted to verify that the machine will be able to meet tolerance specifications.

Deanna also is pursuing an MBA degree at the University of Iowa.

1993-94 SCHOLARSHIP RECIPIENTS

INDUSTRIAL SCHOLARSHIPS

Scholarship	Recipient	Amount
ALCOA	Jonni Anwar	\$750
ALCOA	Rusdy Alie	\$750
ALCOA	Lisa Harrington	\$750
ALCOA	Richard Kennedy	\$750
Andersen Consulting	Aaron Kline	\$1000
Deere & Company	Jennifer Adams	\$1250
General Motors	Kent McDonald	\$2500
John Deere Foundation	Cynthia Snyder	\$2500
Maytag Company Foundation	Matthew Cook	\$500
3M	Erin Aten	\$1000
3M	Tammie Galles	\$1000
3M	Daniel Toft	\$1000

PROFESSIONAL ORGANIZATIONS SCHOLARSHIPS

Scholarship	Recipient	Amount
American Institute of Plant Engineers	Benjamin Jorgensen	\$500
Eastern Iowa Society for Quality Control	Christopher Semelroth	\$1000
Institute of Industrial Engineers	Kusumo Martanto	\$350

ENDOWMENT AND MEMORIAL SCHOLARSHIPS

Scholarship	Recipient	Amount
Marston Club	Justin Hannesson	\$750
Marston Club	Sarah Dunn	\$1000
Marston Club	Tamara Roling	\$1000
General Engineering	Jason Hosch	\$1000
General Engineering	Kusumo Martanto	\$1000
Don Grant Incentive	Janea Johnson	\$300
Don Grant Incentive	Robert Easterling	\$300
Geraldine M. Montag Scholar	Kira Schroeder	\$1100
Geraldine M. Montag Scholar	Angela Sefert	\$1100
Hempstead-Walkup	Michael Weitz	\$850
IE & Healthcare	Therese Wixon	\$250
IE & Healthcare	Melissa Rainey	\$250
Guy Morrison	Ryan Wells	\$2000
George Lamp, Jr.	B. Muralidharan	\$250
Richard Covert	Jill Hodson	\$1000

ALUMNI SPOTLIGHT



Deanna (Ternus) Junge received her B.S. in industrial engineering from Iowa State University in 1991. Following graduation, she joined John Deere Dubuque Works as a manufacturing engineer, in the loader backhoe division. Her first assignment was in the assembly of John

STUDENTS' CREATIVE, PRACTICAL SOLUTION EARNS OUTSTANDING IE DESIGN AWARD

During the 1993 spring semester, teams of students in the senior capstone design course competed to design a solution to a problem posed by SteelWorks of Des Moines. They were asked to design new facility layouts for security box and filing cabinet manufacture. Designs were evaluated on originality, feasibility, thoroughness, and written and oral presentation. The winning team (left to right, Katrina Burmeister, Cynthia Snyder, Letha (Davis) Larson, and seated, Elizabeth Erb) developed a design judged by SteelWorks to be highly creative and practical for the needs of SteelWorks. The team received an award of \$400 from SteelWorks and their names were added to a plaque displayed in the IMSE department. The department and SteelWorks congratulate these students on their excellent design effort.

